

KING COUNTY CONVEYANCE SYSTEM IMPROVEMENT PROJECT

MILL CREEK/GREEN RIVER SUBREGIONAL PLANNING AREA

TASK 260 PLANNING AREA SUMMARY REPORT

July 2001

HDR
In Association with

Herrera Environmental Consultants, Inc.

Note:

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ACKNOWLEDGEMENTS

The following people were involved in or contributed to the writing of this report:

**King County Department of Natural Resources
Wastewater Treatment Division**

Ed Cox
Ron Kohler
Bob Peterson
Bob Swarner

Herrera Environmental Consultants, Inc.

Mike O'Neal
Andy Behnke
Carol Slaughterbeck

HDR Engineering, Inc.

Jim Peterson

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INTRODUCTION

This Task 260 report summarizes the Conveyance System Improvement (CSI) Project team's work in the Mill Creek/Green River Subregional Planning Area (MC/GR) and outlines working alternatives for addressing wastewater conveyance issues in the planning area. The CSI is a comprehensive evaluation of the King County conveyance system and an assessment of requirements to transport wastewater flows projected to the year 2050. A large portion of the wastewater conveyance system in the MC/GR is impacted by high storm flows as a result of high inflow and infiltration (I/I). This fact, combined with significant forecasted population growth in the planning area, means that the capacity of the majority of existing County facilities in the Mill Creek / Green River Subregional Planning Area will be exceeded by the year 2010 for flow projected with a 20 year storm.

This report summarizes the work documented in previous reports prepared for this project. Specifically, the planning area and its planning history were described in the Task 210 report; the existing wastewater facilities in the planning area were described in the Task 220 report; the Task 230 report documented the natural environment; the Task 240 report identified existing capacity limitations and alternative solutions; and the Task 250 report refined the alternatives and presented working alternatives. Two Task 250 supplemental reports provided more detailed information related to the projects identified within the working alternatives. The supplemental reports are summarized in the Task 250 section of this report.

TASK 210: MILL CREEK/GREEN RIVER SUBREGIONAL PLANNING AREA PLANNING RECORD SUMMARY

The MC/GR is shown in Figure 260-1. The MC/GR includes all sewer basins tributary to the Kent Cross Valley Interceptor and ULID 1/2 manhole #52 located in Kent. The planning area includes all or part of the incorporated municipalities of Kent, Auburn, Algona, Black Diamond, Pacific, Covington, and Maple Valley. King County and seven other planning authorities, including six cities and one water and sewer district, have planning jurisdiction within the MC/GR. Local sewer service providers include the cities of Kent, Auburn, Black Diamond, Algona, and Pacific, as well as the Soos Creek Water and Sewer District, which serves portions of unincorporated King County, Covington, and Maple Valley.

The *1958 Metropolitan Seattle Sewerage and Drainage Survey* presents a comprehensive plan to provide gravity sewer service supported by only minimal pump stations to a large portion of the MC/GR. The 1958 plan was amended in 1973 by the *Comprehensive Sewage Disposal Plan, Green River Sewerage Area and Portion of White River Watershed* to include additional area within the MC/GR. In response to the state Growth Management Act, the King County Comprehensive Plan defined an urban growth area, which generally reduced the 1958 planning area. The urban growth area boundary eliminates much of the eastern and southeastern portion of the 1958 planning area but adds some new areas in east Auburn, Black Diamond, and Maple Valley. The MC/GR is entirely within the urban growth area. A number of King County and local municipality planning studies have also been conducted in the last 40 years and have contributed to the existing system. The existing wastewater system is substantially different than the system outlined in the 1958 plan.

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Figure 260-1. Mill Creek/Green River Subregional Planning Area (MC/GR)

TASK 220: MILL CREEK/GREEN RIVER SUBREGIONAL PLANNING AREA EXISTING FACILITIES

The wastewater conveyance system in the MC/GR includes a number of King County trunks and interceptors and three King County pump stations (Pacific, Lakeland Hills, and Black Diamond), as shown in Figure 260-1. The relatively complex system also includes numerous pump stations and conveyance lines owned and operated by the local sewer service providers.

Generally, wastewater is conveyed north from the City of Auburn and the City of Kent through King County interceptors to the South Treatment Plant (STP) in Renton. The Pacific pump station and the Lakeland Hills pump station are located at the southern end of the interceptor and trunk system. Locally owned conveyance systems connect to the King County system at a number of locations between the pump stations and the treatment plant. Wastewater from the cities of Covington, Maple Valley, and Kent flows northwest through the Black Diamond Interceptor and locally owned conveyance lines before rejoining the King County system and flowing to the STP in Renton. The Black Diamond pump station is located at the southern end of the Black Diamond Interceptor. A number of locally owned conveyance systems flow into the King County system at various locations.

Based on planning documents from the local sewer service agencies, numerous upgrades and modifications to the locally owned portions of the MC/GR wastewater conveyance system are planned. These modifications are described in the Task 220 report, but are not summarized in this Task 260 report.

TASK 230: MILL CREEK/GREEN RIVER SUBREGIONAL PLANNING AREA EXISTING CONDITIONS

Design and construction of conveyance facility improvements for the MC/GR must consider environmentally sensitive areas and environmental requirements specified by county regulations and local ordinances. Environment related constraints may make one improvement alternative more costly or less feasible than another.

NATURAL ENVIRONMENT

A variety of sensitive areas exist throughout the MC/GR, as shown in Figure 260-2. These sensitive areas include streams, lakes, wetlands, floodplains, seismic hazard areas, landslide hazard areas, erosion areas, and coalmine hazard areas. The majority of these sensitive areas are located adjacent to the primary rivers, streams, and creeks in the planning area. Some streams and lakes in the MC/GR are designated as Class 1 and Class 2 waterbodies by the state of Washington. Development within 100 feet of Class 1 water bodies is generally prohibited or severely restricted. Development within 50 feet of Class 2 shorelines is prohibited; Class 2 waters known or thought to be salmon-bearing have a 100-foot buffer. Additional sensitive areas restrictions may also apply, including Endangered Species Act requirements.

The largest river in the planning area is the Green River, which originates in the Cascade Mountains northeast of Mount Rainier, and flows west and north before emptying into Elliott Bay as the Duwamish River. Two major tributaries and ten small tributaries feed into the main river in the upper valley between Black Diamond and Auburn. The middle section of the Green River runs primarily through eastern Auburn and north through Kent in the western half of the MC/GR. Big Soos Creek is the major tributary to the Green River along this stretch.

Other primary rivers in the MC/GR are the White River, Mill Creek, and the Soos Creek system that includes Soosette Creek, Covington Creek, Jenkins Creek, Cranmar Creek and an unnamed tributary.

Several large lakes are also located in the MC/GR. These include Lake Meridian, Pipe Lake, Lake Lucerne, Lake Wilderness, and the Lake Sawyer system.

The 1958 plan for wastewater service in the MC/GR was based on gravity interceptors and trunks following the alignment of the major rivers in the area. Because the current system is substantially different than the 1958 plan, alternatives that would bring the system closer to the 1958 plan would include a number of stream crossings and sensitive area issues.

CHANGES IN LAND USE

The Metropolitan King County Council established an Urban Growth Area in the 1994 King County Comprehensive Plan and its 1995 amendments. The King County plan requires future

growth and development to be confined to the urban growth area to limit urban sprawl, enhance open space, protect rural areas, and provide for more efficient use of human services, transportation, and utilities. The plan also identifies a review and approval process for sewer plans within the county. Each local service agency in the MC/GR (except for Algona) has developed and adopted sewer plans or is incorporated as part of another local service area plan.

Local population forecasting involves first forecasting population, employment, and income for the Puget Sound region as a whole and then allocating the forecasts among smaller geographic areas. Overall, the areas included in the MC/GR are expected to have a 47 percent increase in households, a 35 percent increase in residents, and a 28 percent increase in jobs between 1997 and 2020. The largest percentage increases for households and residents are expected in the Lake Tapps/Dieringer, Southwest Soos Creek, and Algona/Pacific areas. In addition, several of the municipalities located in the MC/GR anticipate annexing additional areas over the next few years.

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Figure 260-2. Sensitive Areas in MC/GR

TASK 240: MILL CREEK/GREEN RIVER SUBREGIONAL PLANNING AREA WASTEWATER SERVICE ALTERNATIVE DEVELOPMENT

MC/GR PLANNING ZONES

The MC/GR is divided into three planning zones in order to conveniently analyze and discuss alternatives for increasing system capacity. The planning zones are shown in Figure 260-3.

AUBURN PLANNING ZONE

The Auburn Planning Zone incorporates the area served by the City of Auburn and flows into the following King County interceptors and pump stations: Algona-Pacific Interceptor, Auburn (3) Interceptor, Auburn West Interceptor, Auburn West Valley Interceptor, M St Trunk, N Sewer Interceptor, Lakeland Hills Pump Station and Force Main, and Pacific Pump Station and Force Main. The Auburn Planning Zone includes about 74 percent of the 1958 plan proposed sewers. Amendments to the 1958 plan increased service area and proposed additional interceptors.

KENT PLANNING ZONE

The Kent Planning Zone incorporates the area served by the City of Kent and flows into the following King County interceptors: 277th Interceptor, Auburn (1 and 2) Interceptors, Garrison Creek Interceptor, Kent Cross Valley Interceptor, Mill Creek Interceptor, ULID 1/4 Kent Interceptor, ULID 1/5 Kent Interceptor, ULID 250 North and South Kent Interceptors, and West Hill Interceptor. The Kent Planning Zone includes about 137 percent of the 1958 plan proposed sewers. Amendments to the 1958 plan proposed additional interceptors, which are now in service.

SOOS PLANNING ZONE

The Soos Planning Zone generally includes the area served by the Soos Creek Water and Sewer District (SCWSD) and all or portions of the cities of Covington, Maple Valley, Black Diamond and Kent. Flow from this area is routed into the following King County interceptors and pump stations: Clark Fork Trunk, 277th Interceptor, Black Diamond pump station and conveyance, and Mill Creek Interceptor. The SCWSD development has been independent of the 1958 plan. In the plan, interceptor sewers were routed south along Big Soos Creek and the Green River portions of which are outside the Urban Growth Area. These planned interceptors generally carried flow south by gravity to the Green River eventually arriving in Auburn to join the Auburn Interceptor. The SCWSD system was developed in the northern end of the planned conveyance and grew southward. Since the planned gravity interceptors had not been constructed the SCWSD system collected small areas draining south and pumped the flow north, primarily to the Mill Creek Interceptor. As that interceptor has become overloaded, the Mill Creek Relief Sewer (277th Street Interceptor) was designed and constructed however this has not eliminated the numerous pump stations. Pump stations are generally located on one of the original 1958 plan interceptor alignments so that construction of the interceptors proposed in the

1958 plan could eliminate the pump station. Only 8 percent of the 1958 plan proposed sewers have been built in the Soos Planning Zone.

FLOW PROJECTIONS

To determine wastewater flows, the June 1996 Puget Sound Regional Council Population Forecasts by Traffic Analysis Zones were used to forecast population for years 2010, 2020, 2030, and 2050. Per capita wastewater flow was estimated to be 60 gallons per capita per day (gpcd) for residential, 35 gpcd for commercial, and 75 gpcd for industrial land use based on historical information. Base flow for each decade was determined from forecasted population, and per capita flow values for defined sewer areas (flow projection areas).

In the Auburn and Soos Planning Zones, a calibrated runoff model was used to generate I/I hydrographs and peak flow frequency curves. For the Kent Planning Zone, an I/I rate of 2,900 gpad in 1990 under 20 year storm conditions was assumed for all flow projection areas because no flow data was available to calibrate a runoff model. Flows for the 5 and 10 year storm conditions in the Kent Planning Zone were estimated based on the runoff model results for the Auburn and Soos Planning Zones. Peak I/I flows were projected assuming a 7 percent increase per decade due to sewer degradation.

Wastewater flow projections for each flow projection area in the MC/GR were developed by adding the wastewater base flow component to the inflow and infiltration (I/I) flow component. Flows for each flow projection area were then routed into the County conveyance system model to determine the total flow in each interceptor segment. Modeling indicated that attenuation did not significantly change results, so attenuation was not considered to modify flow rates.

CONVEYANCE SYSTEM REQUIREMENTS AND ALTERNATIVES

Many King County interceptors in the MC/GR will exceed capacity by 2010. Figure 260-3 illustrates the decade pipe capacity is exceeded for each King County facility. Alternatives for increasing capacity were developed assuming that conveyance facilities must have the capacity to carry the 20 year storm flow projected for the year 2050, mechanical equipment has a 20 year service life, and basic infrastructure has a service life in excess of 60 years.

AUBURN PLANNING ZONE

In the Auburn Planning Zone, the projected flow with a 20 year storm exceeds the capacity of most of the existing sewers by 2010. Other sewer capacity will be exceeded by 2020 or 2030. A few short sections of sewer are not exceeded within the study period. The projected 2050 20 year event flow leaving the Auburn Planning Zone through the Auburn (3) Interceptor is about 76 million gallons per day (mgd) but the average capacity of the interceptor in that section is only about 66 mgd.

Two alternatives were developed for this planning effort. The Auburn parallel alternative proposes constructing parallel sewers to the existing interceptors. The Auburn rerouting alternative reroutes flow from specific areas to a new north-south interceptor, thus bypassing existing facilities. Both alternatives are shown in Figure 260-4.

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Figure 260-3. Decade Conveyance Capacity is Exceeded in the MC/GR

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Figure 260-4. Alternatives for Auburn and Kent Planning Zones in the MC/GR

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Auburn Parallel Alternative

Gravity interceptors would be constructed parallel to most of the existing County gravity interceptors in the Auburn Planning Zone in alignments similar to the existing interceptors. It is assumed that the proposed interceptors would carry all flow from areas south of the existing system and pick up additional flow along the route, avoiding reconnection of side sewers. The majority of construction would occur in public right-of-ways. The alternative includes approximately 69,000 linear feet of 12 inch to 42 inch gravity sewer pipe.

Overall, the alternative would require two stream crossings, six railroad crossings, three State Route 18 crossings, two State Route 167 crossings, six public trail crossings, and traffic disruption in a number of areas. Approximately 7,500 feet of interceptor would be constructed between Mill Creek and State Route 167, potentially requiring special provisions to protect Mill Creek during construction.

The Auburn parallel alternative would require construction permits from Auburn and Algona, as well as easements or permits from the state of Washington, railroads, and several private property owners.

A significant portion of the Auburn (3) Interceptor's capacity will not be exceeded until 2020. If I/I reductions can be achieved before that time, future construction of interceptors parallel to Auburn (3) could be eliminated.

Auburn Rerouting Alternative

The Auburn rerouting alternative diverts flow from the existing interceptors to new interceptors, including the Southwest Interceptor that would run north south through the Auburn and Kent Planning Zones, paralleling the West Valley Highway. Flow from several areas in the Auburn Planning zone would be diverted to new interceptors so that all but one short section of the existing system would have sufficient capacity to serve their reduced service areas through the planning period. As shown in Figure 260-4, the 26th Street Trunk, the Lakeland Hills Replacement Trunk, and the Stuck Trunk all flow into the Southwest Interceptor. Overall, the new interceptors would include approximately 56,000 linear feet of 18 inch to 54 inch gravity sewer pipe.

The Auburn rerouting alternative would require five stream crossings, one single track railroad crossing, one multiple track railroad crossing, two State Route 18 crossings, two State Route 167 crossings, one public trail crossing, a tunnel under the Auburn Municipal Airport, and significant traffic disruption. Approximately 7,500 feet would run parallel to Mill Creek, with 5,000 feet near associated wetlands. It is expected that the alignment could avoid major impacts to these areas.

This alternative would require construction permits from Auburn and Algona, as well as easements or permits from the state of Washington, railroads, and the Auburn Municipal Airport. As with the Auburn parallel alternative, successful implementation of I/I reductions prior to 2020 could eliminate the need for additional interceptor capacity along the Auburn (3) Interceptor.

KENT PLANNING ZONE

The projected flow with a 20 year storm exceeds the capacity of most existing sewers in the Kent Planning Zone by 2010. Others will be exceeded by 2020 or 2030, with only a few sections maintaining adequate capacity through 2050. Figure 260-3 shows the decade capacity is exceeded in each interceptor. The projected 2050, 20 year flow leaving the Kent Planning Zone through the Auburn (3) Interceptor is about 124 mgd. The average capacity of the Auburn (3) Interceptor at that point is about 78 mgd.

Two alternatives were developed for this planning effort. The Kent parallel alternative proposes constructing parallel sewers to the existing interceptors. The Kent rerouting alternative reroutes flow from some areas to a new north-south interceptor, thus bypassing existing facilities. Both alternatives are shown in Figure 260-4.

Kent Parallel Alternative

New gravity interceptors would be constructed parallel to most of the existing County system in the Kent Planning Zone. Parallel sewers would not be required for the ULID 250 North Kent Interceptor and the Mill Creek Interceptor south of W James Street, because those interceptors have sufficient capacity for the entire planning period.

The Kent parallel alternative would require two Green River crossings, six stream crossings, three State Route 167 crossings, two railroad crossings, and major traffic disruption. GIS maps indicated several additional stream crossings, including a stream parallel to the sewer for about 2,700 feet. However, these features could not be located on aerial photos. This alternative also includes one sewer alignment in the creek bed of Garrison Creek for 1,400 feet, 400-500 feet in a known slide area, and approximately 4,300 feet that would require easements from private property owners.

Construction permits from the City of Kent would be required for this alternative, in addition to temporary and permanent easements from private property owners, railroads, and agencies responsible for public trails. Sewers that will exceed capacity by 2010 require additional capacity construction before that time.

Kent Rerouting Alternative

The Southwest Interceptor would be constructed along West Valley Highway from the north boundary of Auburn to the South Interceptor currently under construction. Short interties would reroute flow from upstream portions of other interceptors. Capital components for this alternative include approximately 35,200 linear feet of 15 inch to 72 inch gravity sewer pipe.

The Kent rerouting alternative requires one Green River crossing, four stream crossings, one State Route 516 crossing, two railroad crossings and one public trail crossing. GIS maps indicate an additional stream crossing that could not be verified in aerial photos. Traffic disruption will be a significant impact.

This alternative would require permits from the City of Kent, the state of Washington, and railroads. Alternative capacity must be in place prior to 2010.

SOOS PLANNING ZONE

The Black Diamond service area projected 2010 flow with a 20 year storm is approximately 5.3 mgd, which exceeds the 1.6 mgd capacity of the existing Black Diamond Interceptor. The capacity of the Clark Fork trunk and the 277th Interceptor is adequate to carry projected flows with a 20 year storm through 2050.

Four alternatives for increasing capacity in the Soos Planning Zone were investigated. The alternatives are illustrated in Figure 260-5. Alternative 1 generally follows the plan currently being implemented by the Soos Creek Water Sewer District (SCWSD), which differs significantly from the 1958 County plan. Alternatives 2, 3, and 4 represent several alignment alternatives based on the concept that King County might choose to collect and pump flow at several points along the alignments planned in 1958. These alternatives attempt to maximize area served by gravity but continue to intercept flow directed south and pump them north and west to the 277th Street Interceptor.

Each alternative configuration assumes some extent of incorporation of local facilities into the regional system. The greatest opportunity for system integration is in use of existing pipelines. Predesign studies and final design should optimize final integration of local facilities with updated project requirements.

Alternative 1

Under Alternative 1, approximately 46,200 linear feet of gravity sewer and five regional pump stations with associated force mains would be constructed. Regional facilities would serve the same basins that are currently served by SCWSD lift stations 10, 11, and 15B. Force mains would parallel existing SCWSD force main routes in public right-of-ways. The capacity of existing local force mains would also be used. King County would assume responsibility for approximately 55,000 linear feet of local force main and gravity sewer.

Approximately 60 percent of the Soos Planning Zone would be served by gravity sewers flowing to regional facilities, and approximately 40 percent would be pumped to regional facilities. The City of Black Diamond, which represents approximately 18 percent of the planning area, would continue to be served by existing regional pump stations and facilities.

Overall, the alternative would require 11 stream crossings, one railroad crossing, and traffic disruption in a number of areas. Alternative 1 would cross approximately 1100 linear feet of wetland, and would parallel about 200 feet of wetland and 1000 feet of stream. It would require construction permits from Auburn, Black Diamond, Kent, Maple Valley, and Covington. Property must be purchased for all five pump stations. Easements would be required to cross some properties. All facilities must be complete by 2010, based on County flow projections.

Alternative 2

Alternative 2 would include construction of approximately 73,500 linear feet of gravity sewers, approximately 31,200 linear feet of force main, and four regional pump stations. King County would assume responsibility for SCWSD Lift Station 10 and approximately 21,000 linear feet of local associated force main.

Approximately 69 percent of the Soos Planning Zone would flow by gravity to regional facilities and approximately 31 percent would be pumped to regional facilities by local lift stations.

Alternative 2 requires six stream crossings, one railroad crossing, and would cause traffic disruption in several areas. The alternative requires crossing 700 linear feet of wetland, and parallels 200 linear feet of wetland. It requires construction permits from the Cities of Auburn, Black Diamond, Kent, Maple Valley, and Covington for gravity and force mains. Property must be purchased for four pump stations. SCWSD Lift Station 10 would become a regional facility. Permits would be required from the state of Washington. Easements would be required to cross some properties. All facilities must be complete by 2010, based on County flow projections.

Alternative 3

Capital improvements for Alternative 3 include four pump stations, approximately 40,600 linear feet of force main, and approximately 71,300 linear feet of gravity sewer. King County would assume responsibility for existing SCWSD Lift Station 10 and approximately 21,000 linear feet of local force main and gravity sewer.

Approximately 69 percent of the Soos Planning Zone would flow by gravity to regional facilities and approximately 31 percent would be pumped to regional facilities by local lift stations.

Alternative 3 requires six stream crossings, one railroad crossing, and crosses approximately 700 linear feet of wetland. It would require construction permits from the cities of Auburn, Black Diamond, Kent, Maple Valley, and Covington. Property must be purchased for four pump stations. SCWSD Lift Station 10 would become a regional facility. Permits would be required from the state of Washington. Easements would be required to cross some properties. All facilities must be complete by 2010, based on County flow projections.

Alternative 4

Capital improvements for Alternative 4 include four pump stations, approximately 46,000 linear feet of force main, and approximately 74,000 linear feet of gravity sewer. King County would assume responsibility for existing SCWSD Lift Station 10 and approximately 21,000 linear feet of local force main and gravity sewer.

Alternative 4 requires four stream crossings, one railroad crossing, and would cause traffic disruption in a number of areas. The alternative requires crossing 700 feet of wetland and parallels 200 feet of wetland. It would require construction permits from the cities of Auburn, Black Diamond, Kent, Maple Valley, and Covington. Property must be purchased for four pump stations. SCWSD Lift Station 10 would become a regional facility. Permits would be required from the state of Washington. Easements would be required to cross some properties.

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Figure 260-5. Alternatives for the Soos Planning Zone in the MC/GR

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TASK 250: MILL CREEK/GREEN RIVER SUBREGIONAL PLANNING AREA REFINING ALTERNATIVE ANALYSIS

In Task 250, working alternatives were derived from the range of alternatives presented in the Task 240 report. Several issues common to all alternatives are discussed first, followed by more specific information on the working alternatives. The following objectives were considered in deriving the working alternatives.

- Maximize service by gravity;
- Provide flexibility for adapting to changing growth patterns;
- Maximize long term facility use;
- Optimize capital and operating cost;
- Provide benefit to regional and local systems;
- Provide certainty to local service providers;
- Integrate projects with other Regional Wastewater Service Program programs.

A general description and evaluation, including estimated cost is presented in the Task 250 report. Additional project detail was developed and presented in two supplemental reports.

GENERAL ISSUES

Several general issues should be incorporated in further development of working alternatives. These include the following:

- Since the majority of the existing County facilities in the MC/GR will be exceeded by the year 2010, timing of projects will be critical to ensuring that system capacity is not exceeded before projects are constructed. The first priority must be to convey flow that exceeds the capacity of the Auburn Interceptor Sections 1 and 2 in the Kent Planning Zone, since it conveys all flow from the Auburn, Kent, and Soos planning zones.
- The Kent and Auburn planning zones include some short, isolated sections of sewer that are not identified for replacement although they may be slightly surcharged based on projected peak flow conditions. Subsequent studies must develop specific projects to eliminate these critical sections.
- In the Soos Planning Zone, King County flow projections are higher than local agency projections, indicating capacity may be exceeded sooner than local agencies expect. Subsequent studies should explore these differences and the implications for timing of projects and King County potentially taking responsibility for local facilities.

- Final design of regional system components in the Soos Planning Zone should consider and optimize use of local facilities with available capacity. Final configuration should consider any additional facilities planned or recently constructed by the SCWSD.
- Constructability constraints include environmental conditions, schedule requirements, and possible intertie options. More detailed studies must identify these issues as well as alignment variations, pump station siting, storage, permitting requirements, partnership options, regional planning review and coordination requirements.
- Alternative project delivery systems such as design/build may enable the County to reduce the scheduled time to bring projects on line as well as reduce costs. It is not possible to predict specific time or cost savings at this level of planning. The Task 250 report presents a table summarizing issues associated with alternative project delivery systems for each project identified with the working alternatives.

INFLOW AND INFILTRATION

Inflow and infiltration (I/I) represents about 87 percent of the County's peak flow projection for the MC/GR. Two I/I reduction scenarios were modeled to analyze potential benefits for the alternatives. One scenario assumed a 20 percent reduction in the County projected I/I component for all areas, in all decades, under all storms. This reduction would require continual rehabilitation of existing and future sewers throughout the MC/GR.

The second scenario assumed that I/I would be limited to 1,100 gallons per acre per day (gpad) for all new construction, but did not include rehabilitation of existing sewers. I/I projections were escalated 7 percent per decade to account for ongoing degradation of existing sewers.

Results of this modeling indicate that the 20 percent reduction scenario results in a peak flow average reduction of about 17 percent and a 20 percent peak flow average reduction for the 1,100 gpad scenario. The highest reductions in peak flow occur in the Auburn Planning Zone, which has the highest projected total peak flow.

I/I reduction would benefit all alternatives, because smaller pipes would be required to carry the reduced flows. In the Kent and Auburn planning zones, the length of pipe required is also reduced. For these planning zones, I/I reduction would reduce costs more for the parallel alternatives than the rerouting alternatives, because the parallel alternatives require greater lengths of new sewer pipe.

In the Soos Planning Zone, I/I reduction would allow proposed sewer sizes and pump station capacities to be reduced. Estimated project costs could be reduced by 10 to 26 percent. Further development of working alternatives should include the feasibility of implementing the I/I reduction scenarios.

OPERATION AND MAINTENANCE REQUIREMENTS

All alternatives will increase system reliability and increase County operation and maintenance responsibilities. The County would be responsible for at least four to five new pump stations, as well as additional gravity sewers and force mains. Pump stations and force mains generally require more operation and maintenance than gravity sewers.

Three of the four Soos Planning Zone alternatives allow six local pump stations to be eliminated. Tunnels could be constructed to eliminate pump stations, but are not feasible based on cost of tunneling for relatively small diameter pipelines.

COST ESTIMATES

Several levels of cost estimates were prepared reflecting increasing level of detail developed for the alternatives. The first level was a preliminary planning level estimate based on general pipe sizes and average depths. This level estimate was calculated from the initial cost model spreadsheet described in January 7, 2000 draft CSI report on planning level costs. The preliminary planning level estimate was used to compare the initial array of alternatives. A life cycle analysis of alternatives in the Soos Planning Zone was made in order to evaluate the long term impact of operating or eliminating pump stations.

Following the initial review of alternatives with local agencies, refinements were made to the project components. Some of the refinements were derived from preliminary plans and profiles and a second cost estimate was prepared from the refined project details using the CSI cost model Tabula version 0.6.2. Final planning cost estimates were developed using Tabula and project details developed and presented in Task 250 Supplement reports.

Table 260-1 presents final planning level construction and project cost estimates for individual working alternative projects in the Kent, Auburn and Soos planning zones.

WORKING ALTERNATIVES

Working alternatives were derived from the range of alternatives considered for each planning zone based on cost and ability to meet regional system requirements. Specific projects included in each working alternative were also identified. Preliminary planning level construction and project cost estimates for the projects identified as part of the working alternatives were developed at various levels of detail. Costs were initially presented in the Task 250 report and were updated in the Task 250 supplemental reports for the Kent and Auburn planning zones and the Task 250 supplemental report for the Soos Planning Zone.

Table 260-1 presents the most recent cost estimates for each project. Construction costs were developed using the CSI cost model Tabula version 0.6.2, developed by King County. Total project costs were developed using King County's budget model. The budget model calculates total project costs based on construction costs generated by Tabula and percentage allowances for various non-construction project requirements.

Table 260-1. Final Planning Level Construction and Project Cost Estimates

Planning Zone	Project	Construction Cost (million dollars)	Project Cost (million dollars)
Auburn	26th Street Trunk	\$2.1	\$4.6
	Stuck River Trunk	\$9.2	\$19.7
	Southwest Interceptor	\$32.8	\$67.1
Kent	Garrison Creek Relief Trunk	\$12.4	\$26.6
	James Trunk	\$4.4	\$9.5
	Meeker Trunk	\$2.6	\$5.5
	Southwest Interceptor	\$41.7	\$85.1
Soos	Gravity Sewers	\$39.4	\$80.5
	Forcemain B	\$3.2	\$7.0
	Forcemain D	\$8.0	\$17.0
	Forcemain F	\$1.4	\$2.9
	Forcemain H	\$0.3	\$0.6
	PS B	\$2.8	\$5.9
	PS C Early Implementation	\$5.2	\$11.1
	PS D	\$8.6	\$18.4
	PS F	\$4.9	\$10.3
	PS H	\$2.3	\$4.9
Total Cost (million dollars)		\$181.3	\$376.7

(2001 dollars)

AUBURN AND KENT PLANNING ZONES

Two alternatives were proposed for the Auburn and Kent planning zones. One alternative proposed construction of sewers parallel to the existing County interceptors and the other alternative proposed one major interceptor and some smaller interceptors to reroute excess flow. Cost of the two alternatives was similar, with the rerouting alternative being slightly less expensive. The cost of both alternatives could be reduced if I/I reduction is implemented quickly. Both alternatives require crossing the Green River, but the rerouting alternative involves fewer constructability issues than the parallel alternative. The working alternative was developed from the reroute alternative.

The primary feature of this alternative is the new Southwest Interceptor, which would carry flow through the Auburn and Kent planning zones. Several smaller conveyance system additions are required to fully manage future flow within these planning zones. Flow projections indicate that the working alternative must be functional by year 2010.

SOOS PLANNING ZONE

Four alternatives were proposed for the Soos Planning Zone. Alternative 1 proposes sewer construction parallel to the existing local interceptors and five new pump stations. Alternatives 2, 3, and 4 propose one major interceptor parallel to the south boundary of the urban growth area

then northwest to the South 277th Interceptor, some sewers parallel to existing local interceptors, four new pump stations, and using SCWSD Lift Station 10. Lift Station 10 may have to be replaced under any of the four alternatives if regional facilities are not constructed by the time additional capacity is required.

The four alternatives achieve the required hydraulic capacity in varying ways. A direct comparison of capital cost alone does not adequately represent the advantages and disadvantages of these variations. The most notable differences include the following:

1. Alternative 1 provides less opportunity to eliminate local pump stations.
2. Alternative 1 requires construction of more new regional pump stations, unless Lift Station 10B is constructed.
3. More Alternative 1 pump stations are associated with force mains likely to require sulfide control (that is, chemical feed systems built into the pump station).
4. Alternative 1 provides direct gravity service to the least total acreage in the Soos Planning Zone.

Since the various Soos alternatives included gravity sewers as well as differing numbers of new or eliminated pump stations, a life cycle evaluation was made to compare total costs over a 30 year period. The analysis showed very little difference between alternatives 1, 3 and 4 with the difference being less than the level of accuracy in the estimate.

The working alternative for the Soos Planning Zone was derived from Alternative 3. This alternative is similar to Alternative 1, but most closely resembles the level of service developed in the 1958 plan, and provides more flexibility to manage growth that has moved from the northern part of the planning zone to the southern part of the planning zone.

In addition to current service areas, the Soos Planning Zone working alternative must consider the possibility of extending service to the City of Enumclaw. Extending service would add an estimated 8.2 mgd in the Stuck River Trunk and the Southwest Interceptor, increasing required pipe sizes and costs.